

Form ESA-B4. Summary Report for ESA-PH-254-3
Public Report - Final

Company	United States Steel Corporation	ESA Dates	Dec 17, 2008 - Dec 19 2008
Plant	East Chicago Tin	ESA Type	Steam System Assessment
Product	Tin & coated, cold rolled steel sheets	ESA Specialist	Ven V. Venkatesan

Brief Narrative Summary Report for the Energy System Assessment:

Introduction:

U. S. Steel Corporation's East Chicago Tin (ECT) plant in East Chicago, IN produces cold rolled steel sheets that are surface treated and coated with Tin and other special metals. The cold rolling mill is a 6-stand mill and has a Temper mill also. The plant has both continuous & batch annealing capabilities. The pickling operation of the incoming hot rolled coils is carried out at a sister plant across the fence. Tin & Chrome coating lines are provided with a cleaning line also. All the cleaning & coating lines are heated by steam to maintain the liquid solutions at the required elevated temperatures. Steam is purchased from the neighboring refinery at 350-psig pressure, reduced to about 80 to 90-psig at a pressure reducing valve (PRV) station inside the mill and distributed to the various steam users, including the pickling line across the fence. As per the steam purchase contract, returning back the condensate is not a requirement and hence most of the collected condensate is drained to sewer. Since steam purchase is a substantial part of the utility cost, this ESA is focusing on the steam system at ECT.

Objective of ESA:

To provide U.S. industries with technical assistance targeted to reduce their fuel expenditures.

Focus of Assessment:

The focus of Energy (Steam) System Assessment (ESA) is as follows: (1) to train in-plant personnel to continue and sustain the improvement and (2) to identify energy waste reduction opportunities. This ESA is focused on the Steam Distribution, Utilization & Condensate drain systems at U. S. Steel's ECT facility in East Chicago, IN.

Approach for ESA:

USDOE qualified specialist provided training to the plant personnel in the use of USDOE's SSAT Tool and helped them in completing an initial assessment using the SSAT model developed for U. S. Steel's ECT facility.

General Observations of Potential Opportunities:

General Observations

The reported natural gas consumption at this site during the past 12 months was 472,269 MMBtu.

The reported electrical consumption at this site during the past 12 months was 119,786,000 kWh with peak demands touching close to 12 MW.

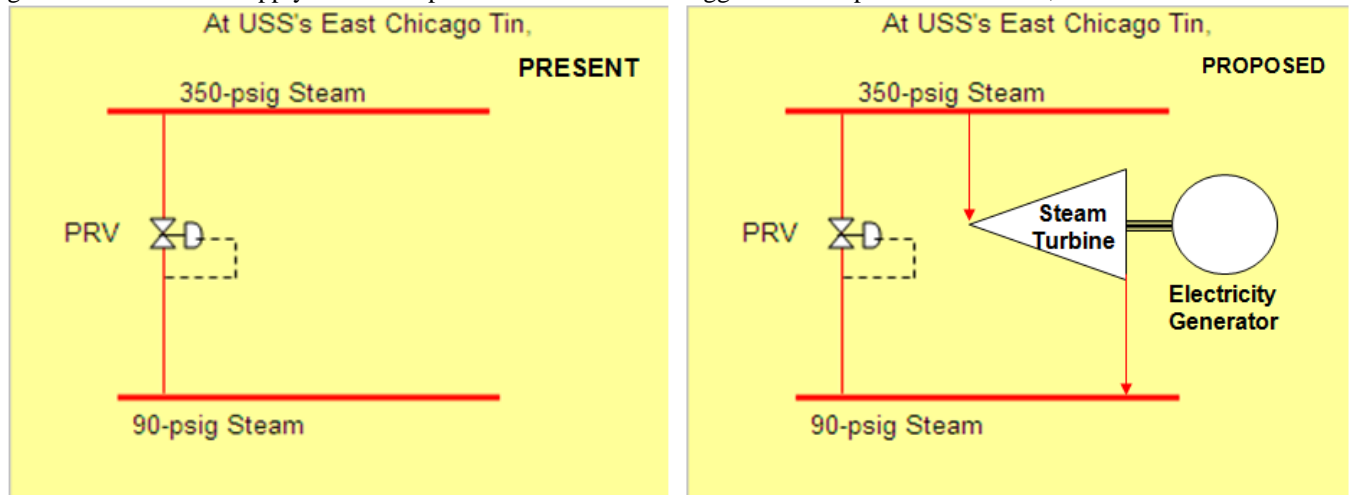
Potential energy saving opportunities

With the help of plant's engineering team, DOE's Steam system assessment during Dec 17 - 19, 2008 has identified the following potential opportunities to reduce the Natural gas usage: They are classified as Near, Medium & Long term opportunities as defined below:

- ☐ Near term opportunities would include actions that could be taken as improvements in operating practices, maintenance of equipment or relatively low cost actions (or equipment purchases).
- ☐ Medium term opportunities would require purchase of additional equipment and/or changes in the system. It would be necessary to carryout further engineering and return on investment analysis.
- ☐ Long term opportunities would require testing of new technology and confirmation of performance of these technologies under the plant operating conditions with economic justification to meet the corporate investment criteria.

1. Install a back pressure turbine to reduce the steam flow through the 350>90 PRV

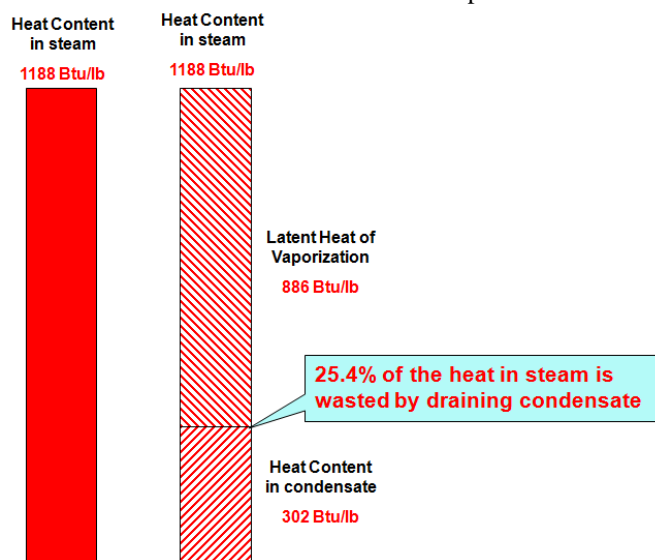
At present about 90,000 lbs/hr of 350-psig steam is continuously passed through the pressure reducing valve (PRV) station to distribute 90-psig steam to various users. Steam pressure reduction using a control valve wastes the recoverable mechanical energy in steam compared to pressure reduction using a turbine. Hence, it is recommended to install a steam turbine parallel to the existing PRV station to reduce the 350-psig steam to the distribution header. The turbine can drive an electricity generator that would supply DC or AC power to the mill. The suggested concept is shown below;



By recovering shaft power from high pressure steam using a steam turbine, U. S. Steel's ECT site would save \$326,800 annually. (Medium term)

2. Recover the condensate that is presently drained to substitute the hot water in the process

At present all the condensate from the various heating coils of the Tin line is drained to sewer. Since the condensate at 90-psig pressure still holds 25% of the heat in steam, draining it is not only a water loss, but also a substantial energy loss. Hence it is recommended to route all the condensate from various steam traps to the hot water tank nearby.



By routing the condensate to the hot water tank instead of draining it, U. S. Steel's ECT site would save \$596,600 annually. (Near term)

3. Implement a Steam Trap Maintenance Program

The U. S. Steel's ECT site has about 300 steam traps installed at various locations, mostly in the 90-psig steam distribution system. No previous records about previous steam trap surveys are available. The failed trap population in the steam distribution system may be high. Hence a proper steam trap survey and maintenance program needs to be initiated at USS-ECT site to cut down the losses due to the failed steam traps.

A well-maintained steam trap population at USS-ECT would save \$38,700 annually.

(Near Term)

4. Implement a Steam Leak Maintenance Program

At U. S. Steel's ECT site, the Tin coating line and the PRV station area have visible steam leaks. In order to reduce the steam system losses and to maintain the "best in class" status, USS-ECT should initiate a periodic leak survey and repair program.

A well-maintained leak free steam distribution piping at USS-ECT would save \$4,100 annually.

(Near Term)

5. Insulate bare steam lines inside the process area

At the U. S. Steel's ECT site, the steam supply header and the branch lines at the Tin coating line area are not insulated. At few piping sections, insulation is provided for personal protection only. A brief sample insulation survey was conducted at the Tin coating line area and the observations were evaluated for heat losses using the 3E-Plus software. Since the other process coating lines also are in the same condition, the heat loss impacts are extended to the other lines also. In order to reduce the steam system heat losses and to maintain the "best in class" status, USS-ECT should insulate all the bare steam & condensate pipe lines.

A well-insulated, leak free steam distribution piping at USS-ECT would save \$107,000 annually.

(Medium Term)

Management Support and Comments:

U. S. Steel Corporation is a well established company, with a long history of developing & implementing energy cost control measures in USA. U. S. Steel's East Chicago Tin plant management has shown interest & enthusiasm to save energy. The senior management team's participation in the wrap-up presentation of this ESA confirms their commitment to save more energy at their site. They expressed their interest to implement some of the ESA recommendations upon review of the ESA summary report.

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